WHAT IS CLAIMED IS:

1. A saccharide comprising a structure selected from any one of Formula O1, Formula O1A, Formula O1B, Formula O1C, Formula O2, Formula O3, Formula O4, Formula O4:K52, Formula O4:K6, Formula O5, Formula O5ab, Formula O5ac, Formula O6, Formula O6:K2; K13; K15, Formula O6:K54, Formula O7, Formula O8, Formula O9, Formula O10, Formula O11, Formula O12, Formula O13, Formula O14, Formula O15, Formula O16, Formula O17, Formula O18, Formula O18A, Formula O18ac, Formula O18A1, Formula O18B, Formula O18B1, Formula O19, Formula O20, Formula O21, Formula O22, Formula O23, Formula O23A, Formula O24, Formula O25, Formula O25a, Formula O25b, Formula O26, Formula O27, Formula O28, Formula O29, Formula O30, Formula O32, Formula O33, Formula O34, Formula O35, Formula O36, Formula O37, Formula O38, Formula O39, Formula O40, Formula O41, Formula O42, Formula O43, Formula O44, Formula O45, Formula O45, Formula O45rel, Formula O46, Formula O48, Formula O49, Formula O50, Formula O51, Formula O52, Formula O53, Formula O54, Formula O55, Formula O56, Formula O57, Formula O58, Formula O59, Formula O60, Formula O61, Formula O62, Formula $62D_1$, Formula O63, Formula O64, Formula O65, Formula O66, Formula O68, Formula O69, Formula O70, Formula O71, Formula O73, Formula O73, Formula O74, Formula O75, Formula O76, Formula O77, Formula O78, Formula O79, Formula O80, Formula O81, Formula O82, Formula O83, Formula O84, Formula O85, Formula O86, Formula O87, Formula O88, Formula O89, Formula O90, Formula O91, Formula O92, Formula O93, Formula O95, Formula O96, Formula O97, Formula O98, Formula O99, Formula O100, Formula O101, Formula O102, Formula O103, Formula O104, Formula O105, Formula O106, Formula O107, Formula O108, Formula O109, Formula O110, Formula 0111, Formula O112, Formula O113, Formula O114, Formula O115, Formula O116, Formula O117, Formula O118, Formula O119, Formula O120, Formula O121, Formula O123, Formula O124, Formula O125, Formula O126, Formula O127, Formula O128, Formula O129, Formula O130, Formula O131, Formula O132, Formula O133, Formula O134, Formula O135, Formula O136, Formula O137, Formula O138, Formula O139, Formula O140, Formula O141, Formula O142, Formula O143, Formula O144, Formula O145, Formula O146, Formula O147, Formula O148, Formula O149, Formula O150, Formula O151, Formula O152, Formula O153, Formula O154, Formula O155, Formula O156, Formula O157, Formula O158, Formula O159, Formula O160, Formula O161, Formula O162, Formula O163, Formula O164, Formula O165, Formula O166, Formula O167, Formula O168, Formula O169, Formula O170, Formula O171, Formula O172, Formula O173, Formula O174, Formula O175, Formula O176, Formula O177, Formula O178, Formula O179, Formula O180, Formula

   O181, Formula O182, Formula O183, Formula O184, Formula O185, Formula O186, Formula O187, wherein *n* is greater than the number of repeat units in the corresponding wild-type *E. coli* polysaccharide.

2. The saccharide according to claim 1, wherein *n* is an integer from 31 to 100.
3. The saccharide according to claim 1, wherein the saccharide comprises a structure according to any one of Formula O1A, Formula O1B, and Formula O1C, Formula O2, Formula O6, and Formula O25B.
4. The saccharide according to claim 1, wherein the saccharide is produced in a recombinant host cell that expresses a wzz family protein having at least 90% sequence identity to any one of SEQ ID NO: 20, SEQ ID NO: 21, SEQ ID NO: 22, SEQ ID NO: 23, SEQ ID NO: 24, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18, and SEQ ID NO: 19.
5. The saccharide according to claim 4, wherein the protein comprises any one of SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18, and SEQ ID NO: 19.
6. The saccharide according to claim 1, wherein the saccharide is synthetically synthesized.
7. A conjugate comprising a carrier protein covalently bound to a saccharide, said saccharide comprising a structure selected from any one of Formula O1, Formula O1A, Formula O1B, Formula O1C, Formula O2, Formula O3, Formula O4, Formula O4:K52, Formula O4:K6, Formula O5, Formula O5ab, Formula O5ac, Formula O6, Formula O6:K2; K13; K15, Formula O6:K54, Formula O7, Formula O8, Formula O9, Formula O10, Formula O11, Formula O12, Formula O13, Formula O14, Formula O15, Formula O16, Formula O17, Formula O18, Formula O18A, Formula O18ac, Formula O18A1, Formula O18B, Formula O18B1, Formula O19, Formula O20, Formula O21, Formula O22, Formula O23, Formula O23A, Formula O24, Formula O25, Formula O25a, Formula O25b, Formula O26, Formula O27, Formula O28, Formula O29, Formula O30, Formula O32, Formula O33, Formula O34, Formula O35, Formula O36, Formula O37, Formula O38, Formula O39, Formula O40, Formula O41, Formula O42, Formula O43, Formula O44, Formula O45, Formula O45, Formula O45rel, Formula O46, Formula O48, Formula O49, Formula O50, Formula O51, Formula O52, Formula O53, Formula O54, Formula O55, Formula O56, Formula O57, Formula O58, Formula O59, Formula O60, Formula O61, Formula O62, Formula $62D_1$, Formula O63, Formula O64, Formula O65, Formula O66, Formula O68, Formula O69, Formula O70, Formula O71, Formula O73, Formula O73, Formula O74, Formula O75, Formula O76, Formula O77, Formula O78, Formula O79, Formula O80, Formula O81, Formula O82, Formula O83, Formula O84, Formula O85, Formula O86, Formula O87, Formula O88, Formula O89, Formula O90, Formula O91, Formula O92, Formula O93, Formula O95, Formula O96, Formula O97, Formula

   O98, Formula O99, Formula O100, Formula O101, Formula O102, Formula O103, Formula O104, Formula O105, Formula O106, Formula O107, Formula O108, Formula O109, Formula O110, Formula 0111, Formula O112, Formula O113, Formula O114, Formula O115, Formula O116, Formula O117, Formula O118, Formula O119, Formula O120, Formula O121, Formula

O123, Formula O124, Formula O125, Formula O126, Formula O127, Formula O128, Formula O129, Formula O130, Formula O131, Formula O132, Formula O133, Formula O134, Formula O135, Formula O136, Formula O137, Formula O138, Formula O139, Formula O140, Formula O141, Formula O142, Formula O143, Formula O144, Formula O145, Formula O146, Formula O147, Formula O148, Formula O149, Formula O150, Formula O151, Formula O152, Formula O153, Formula O154, Formula O155, Formula O156, Formula O157, Formula O158, Formula O159, Formula O160, Formula O161, Formula O162, Formula O163, Formula O164, Formula O165, Formula O166, Formula O167, Formula O168, Formula O169, Formula O170, Formula O171, Formula O172, Formula O173, Formula O174, Formula O175, Formula O176, Formula O177, Formula O178, Formula O179, Formula O180, Formula O181, Formula O182, Formula O183, Formula O184, Formula O185, Formula O186, Formula O187, wherein *n* is an integer from 1 to 100.

8. The conjugate according to claim 7, wherein the saccharide comprises any one of the following Formula O25b, Formula O1A, Formula O2, and Formula O6.

9. The conjugate according to claim 7, wherein the saccharide further comprises any one of an *E. coli* R1 moiety, *E. coli* R2 moiety, *E. coli* R3 moiety, *E. coli* R4 moiety, and *E. coli* K-12 moiety.

10. The conjugate according to claim 7, wherein the saccharide does not further comprise any one of an *E. coli* R1 moiety, *E. coli* R2 moiety, *E. coli* R3 moiety, *E. coli* R4 moiety, and *E. coli* K-12 moiety.The conjugate according to claim 7, wherein the saccharide does not further comprise an *E. coli* R2 moiety.

11. The conjugate according to claim 7, wherein the saccharide further comprises a 3-deoxy-d-manno-oct-2-ulosonic acid (KDO) moiety.

12. The conjugate according to claim 7, wherein the carrier protein is selected from any one of CRM_{197}, diphtheria toxin fragment B (DTFB), DTFB C8, Diphtheria toxoid (DT), tetanus toxoid (TT), fragment C of TT, pertussis toxoid, cholera toxoid, or exotoxin A from Pseudomonas aeruginosa; detoxified Exotoxin A of *P. aeruginosa* (EPA), maltose binding protein (MBP), detoxified hemolysin A of *S. aureus*, clumping factor A, clumping factor B, Cholera toxin B subunit (CTB), *Streptococcus pneumoniae* Pneumolysin and detoxified variants thereof, *C. jejuni* AcrA, and *C. jejuni* natural glycoproteins.

13. The conjugate according to claim 7, wherein the carrier protein is CRM_{197}.

14. The conjugate according to claim 7, wherein the carrier protein is tetanus toxoid.

15. The conjugate according to claim 7, wherein the ratio of saccharide to protein is at least 0.5 to at most 2.

16. The conjugate according to claim 7, wherein the conjugate is prepared via reductive amination.

17. The conjugate according to claim 7, wherein the saccharide is conjugated to the carrier protein through a (2-((2-oxoethyl)thio)ethyl)carbamate (eTEC) spacer.

~~18. The conjugate according to claim 7, wherein the saccharide is a single-end linked conjugated saccharide.~~

~~19. The conjugate according to claim 11, wherein the saccharide is conjugated to the carrier protein through a 3-deoxy-d-manno-oct-2-ulosonic acid (KDO) residue.~~

~~20. The conjugate according to claim 7, wherein the conjugate is prepared via CDAP chemistry.~~

~~21. A composition comprising (a) a conjugate comprising a carrier protein covalently bound to a saccharide comprising Formula O25b, wherein *n* is an integer from 31 to 90, (b) a conjugate comprising a carrier protein covalently bound to a saccharide comprising Formula O1A, wherein *n* is an integer from 31 to 90, (c) a conjugate comprising a carrier protein covalently bound to a saccharide comprising Formula O2, wherein *n* is an integer from 31 to 90, and (d) a conjugate comprising a carrier protein covalently bound to a saccharide comprising and Formula O6, wherein *n* is an integer from 31 to 90.~~

~~22. The composition according to claim 21, further comprising a conjugate comprising a carrier protein covalently bound to a saccharide comprising a structure selected from any one of the following: Formula O15, Formula O16, Formula O17, Formula O18 and Formula O75, wherein *n* is an integer from 31 to 90.~~

~~23. The composition according to claim 21, comprising at most 25% free saccharide as compared to the total amount of saccharide in the composition.~~

~~24. A method of eliciting an immune response against *Escherichia coli* in a mammal, comprising administering to the mammal an effective amount of the composition according to any one of claims 21 to 23.~~

~~25. The method according to claim 24, wherein the immune response comprises opsonophagocytic antibodies against *E. coli*.~~

~~26. The method according to claim 24, wherein the immune response protects the mammal from an *E. coli* infection.~~

CLAIMS

1. A saccharide comprising a structure selected from any one of Formula O1A, Formula O1B, Formula O1C, Formula O2, Formula O3, Formula O4:K52, Formula O4:K6, Formula O5ab, Formula O5ac, Formula O6:K2, Formula O6:K13, Formula O6:K15, Formula O6:K54, Formula O7, Formula O8, Formula O9, Formula O10, Formula O16, Formula O17, Formula O18A, Formula O18ac, Formula O18A1, Formula O18B, Formula O18B1, Formula O20ab, Formula O20ac, Formula O21, Formula O22, Formula O23A, Formula O24, Formula O25, Formula O25a, Formula O25b, Formula O26, Formula O28, Formula O35, Formula O36, Formula O44, Formula O45, Formula O45rel, Formula O52, Formula O54, Formula O55, Formula O56, Formula O57, Formula O58, Formula $62D_1$, Formula O64, Formula O65, Formula O66, Formula O68, Formula O69, Formula O73, Formula O74, Formula O75, Formula O76, Formula O77, Formula O78, Formula O83, Formula O86, Formula O88, Formula O90, Formula O91, Formula O97, Formula O98, Formula O104, Formula O105, Formula O111, Formula O113, Formula O114, Formula O116, Formula O117, Formula O119, Formula O121, Formula O124, Formula O125, Formula O126, Formula O127, Formula O128, Formula O136, Formula O138, Formula O139, Formula O140, Formula O141, Formula O142, Formula O143, Formula O147, Formula O149, Formula O152, Formula O153 Formula O157, Formula O158, Formula O159, Formula O164, Formula O167, Formula O172, Formula O173 listed in Table 1, wherein *n* is an integer consisting of 31 to 100 in the Formula thereof for each saccharide molecule.

2. The saccharide according to claim 1, wherein the saccharide comprises a structure according to any one of Formula O1A, Formula O1B, and Formula O1C, Formula O2, Formula O6:K2, Formula O6:K13, Formula O6:K15, Formula O6:K54, and Formula O25b.

3. The saccharide according to claim 1, wherein the saccharide is produced in a recombinant host cell that expresses a wzz family protein having at least 90% sequence identity to any one of SEQ ID NO: 20, SEQ ID NO: 21, SEQ ID NO: 22, SEQ ID NO: 23, SEQ ID NO: 24, SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18, and SEQ ID NO: 19.

4. The saccharide according to claim 3, wherein the protein comprises any one of SEQ ID NO: 15, SEQ ID NO: 16, SEQ ID NO: 17, SEQ ID NO: 18, and SEQ ID NO: 19.

5. The saccharide according to claim 1, wherein the saccharide is synthetically synthesized.

6. A conjugate comprising a carrier protein covalently bound to a saccharide, said saccharide comprising a structure selected from any one of Formula O1A, Formula O1B, Formula O1C, Formula O2, Formula O3, Formula O4:K52, Formula O4:K6, Formula O5ab, Formula O5ac, Formula O6:K2, Formula O6:K13, Formula O6:K15, Formula O6:K54, Formula O7, Formula O8, Formula O9, Formula O10, Formula O16, Formula O17, Formula O18A, Formula O18ac, Formula O18A1, Formula O18B, Formula O18B1, Formula O20ab, Formula O20ac, Formula O21, Formula O22, Formula O23A, Formula O24, Formula O25, Formula O25a, Formula O25b, Formula O26, Formula O28, Formula O35, Formula O36, Formula O44, Formula O45, Formula O45rel, Formula O52, Formula O54, Formula O55, Formula O56, Formula O57, Formula O58, Formula $O62D_1$, Formula O64, Formula O65, Formula O66, Formula O68, Formula O69, Formula O73, Formula O74, Formula O75, Formula O76, Formula O77, Formula O78, Formula O83, Formula O86, Formula O88, Formula O90, Formula O91, Formula O97, Formula O98, Formula O104, Formula O105, Formula O111, Formula O113, Formula O114, Formula O116, Formula O117, Formula O119, Formula O121, Formula O124, Formula O125, Formula O126, Formula O127, Formula O128, Formula O138, Formula O139, Formula O140, Formula O141, Formula O142, Formula O143, Formula O147, Formula O149, Formula O152, Formula O153, Formula O157, Formula O158, Formula O159, Formula O164, Formula O167, Formula O172, and Formula O173 listed in Table 1, wherein n is an integer consisting of 31 to 100 in the Formula thereof for each saccharide molecule.

7. The conjugate according to claim 6, wherein the saccharide comprises any one of the following Formula O25b, Formula O1A, Formula O2, Formula O6:K2, Formula O6:K13, Formula O6:K15, and Formula O6:K54.

8. The conjugate according to claim 6, wherein the saccharide further comprises any one of an *E. coli* R1 moiety, *E. coli* R2 moiety, *E. coli* R3 moiety, *E. coli* R4 moiety, and *E. coli* K-12 moiety.

9. The conjugate according to claim 6, wherein the saccharide does not further comprise an *E. coli* R2 moiety.

10. The conjugate according to claim 6, wherein the saccharide further comprises a 3-deoxy-d-manno-oct-2-ulosonic acid (KDO) moiety.

11. The conjugate according to claim 6, wherein the carrier protein is selected from any one of diphtheria toxin CRM_{197}, diphtheria toxin fragment B (DTFB), DTFB C8, Diphtheria toxoid (DT), tetanus toxoid (TT), fragment C of TT, pertussis toxoid, cholera toxoid, exotoxin A from Pseudomonas aeruginosa, detoxified Exotoxin A of *P. aeruginosa* (EPA), maltose binding protein (MBP), detoxified hemolysin A of *S. aureus*, clumping factor A, clumping factor B, Cholera toxin B subunit (CTB), *Streptococcus pneumoniae* Pneumolysin or detoxified variants thereof, *C. jejuni* AcrA, and *C. jejuni* natural glycoproteins.

12. The conjugate according to claim 6, wherein the carrier protein is CRM_{197}.

13. The conjugate according to claim 6, wherein the carrier protein is tetanus toxoid.

14. The conjugate according to claim 6, wherein the mass ratio of saccharide to the carrier protein is at least 0.5 to at most 2.

15. The conjugate according to claim 6, wherein the conjugate is prepared via reductive amination.

16. The conjugate according to claim 6, wherein the saccharide is conjugated to the carrier protein through a (2-((2-oxoethyl)thio)ethyl)carbamate (eTEC) spacer.

17. The conjugate according to claim 6, wherein the saccharide is a single-end linked conjugated saccharide.

18. The conjugate according to claim 10, wherein the saccharide is conjugated to the carrier protein through a 3-deoxy-d-manno-oct-2-ulosonic acid (KDO) residue.

19. The conjugate according to claim 6, wherein the conjugate is prepared via 1-cyano-4-dimethylamino pyridinium tetrafluoroborate (CDAP) chemistry.

20. A composition comprising (a) a conjugate comprising a carrier protein covalently bound to a saccharide comprising Formula O25b, wherein *n* is an integer consisting of 31 to 90 in the Formula thereof for each saccharide molecule, (b) a conjugate comprising a carrier protein covalently bound to a saccharide comprising Formula O1A, wherein *n* is an integer consisting of 31 to 90 in the Formula thereof for each saccharide molecule, (c) a conjugate comprising a carrier protein covalently bound to a saccharide comprising Formula O2, wherein *n* is an integer consisting of 31 to 90 in the Formula thereof for each saccharide molecule, and (d) a

conjugate comprising a carrier protein covalently bound to a saccharide comprising Formula O6:K2, Formula O6:K13, Formula O6:K15, and Formula O6:K54, wherein *n* is an integer consisting of 31 to 90 in the Formula thereof for each saccharide molecule.

21. The composition according to claim 20, further comprising a conjugate comprising a carrier protein covalently bound to a saccharide comprising a structure selected from any one of the following: Formula O16, Formula O17, Formula O18 and Formula O75, wherein *n* is an integer consisting of 31 to 90 in the Formula thereof for each saccharide molecule.

22. The composition according to claim 20, wherein the composition comprises at most 25% free saccharide as compared to the total amount of saccharide in the composition.

23. A method of eliciting an immune response against *Escherichia coli* in a mammal, wherein an effective amount of the composition according to any one of claims 20 to 22 is to be administered to the mammal.

24. The method according to claim 23, wherein the immune response comprises opsonophagocytic antibodies against *E. coli*.

25. The method according to claim 23, wherein the immune response protects the mammal from an *E. coli* infection.